REMARKS

Applicants have now had an opportunity to review the November 29, 2007, Final Office Action and request reconsideration of the application.

Claims 1-5 are currently pending in the application.

The Office Action

Claims 1-5 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Publication No. 2003/0077515 to Chen, et al.

Claim 1 was provisionally rejected on the grounds of non-statutory obviousness-type double patenting as being unpatentable over co-pending application U.S. Serial No. 10/567,740 in view of U.S. Publication No. 2003/0077515 to Chen, et al.

For the reasons outlined below, it is submitted that the claims are in condition for allowance.

The Double Patenting Rejections

The Examiner's attention is drawn to the allowed claims of co-pending Application Serial No.10/567,740. In that case, a Notice of Allowance has been issued, canceling claims 1, 2, 8 and 9. None of the allowed claims are directed to a gel or gel composition.

Accordingly, it is respectfully requested that the double patenting rejection be withdrawn.

The §102(e) Rejections

Claim 1 recites a gel comprising a carbon nanotube and an ionic liquid, wherein the ionic liquid is a salt which assumes a molten state at or very near room temperature.

There is no suggestion of such a composition in Chen.

Contrary to the Examiner's assertion, the composite (electronically conductive composite of electronically conductive polymer and carbon nanobes) as disclosed in Chen does not contain an ionic liquid. Chen's composites are formed by two methods. The first is electrochemical polymerization (electrochemical method) and the second is gel polymerization (slow chemical oxidation to produce a gel), both being conducted by

polymerization of monomer in a carbon nanotube suspension (ABSTRACT, ¶ [0015], claim 14, claim 16).

Chen's composite formed by the electrochemical method (method (1)) is made of conducting polymer and carbon nanotube (CNT) and is in the form of a thin film (i.e. solid, not gel) (see ¶ [0038], [0049]). Ionic liquids are exemplified simply as a solvent for composing an electrolyte for use in the electrochemical polymerization (see ¶ [0040]) and thus are to be removed by washing from the final products (composite films).

As disclosed in Chen, method (1) includes (1-1) preparation of a dispersion of CNT in a solution of monomer(s), and (2-2) polymerization of the dispersion to form a polymer containing CNT dispersed therein. The dispersion (1-1) is a suspension of CNT within an electrolyte for use in the electrochemical polymerization. The dispersion comprises monomer(s) and CNT and may include solvent. The solvent is aqueous or non-aqueous (see ¶ [0036]). The CNT may be pre-treated with an oxidizing acidic medium to impart the electrolytic property (¶ [0038]). However, there is no suggestion in the Chen reference that a gel may be formed in the step of preparing the dispersion. The composition disclosed in this step is not a gel but a suspension. The Chen dispersion (1-1) is clearly distinguished from the presently claimed invention.

The composite formed by the electrochemical polymerization method is in the form of a film (i.e. a solid) and not a gel. From the descriptions of "In the electrochemical method of making conducting polymer-carbon nanotube composite films of the first aspect of the invention," [0038] and "Electrochemical polymerization leads to the formation of a thin film" [0049], it is clear that the composite formed by the electrochemical polymerization is in the form of a film and is not a gel. Further, it is stated that "···the electrochemically polymerized or gelled materials described above ···" [0053]. From this statement it can be seen that the composite formed by the electrochemical polymerization is distinguished from that formed by the other polymerization and is not a gel. The term "film" to express the composite formed by the electrochemical polymerization is frequently used throughout the Chen reference, for example, in [0036], [0038], [0049], [0053], [0067], [0074], [0076], [0077], [0086], [0090], [0091], [0092], [0093], [0094] and [0099], from which it is also evident that the composite formed by the electrochemical polymerization is not a gel.

As described in ¶ [0016] of the present specification, "Pulverization of a carbon nanotube under a shearing force using an ordinary organic solvent or an ionic liquid precursor, instead of an ionic liquid, will not produce the gel composition." Ionic liquids are shown, in ¶ [0016] of Chen reference, simply as examples of solvents for use in the electrochemical polymerization (method (1)). There is no suggestion in Chen of a gel composition consisting of CNT and ionic liquid.

In the second method (method (2)) for forming Chen's composite, the gel composite does not contain any ionic liquid, as can be seen from the method for producing the same. Rather, the gel is formed simply by allowing a polymerizable monomer (such as pyrrole) and carbon nanotube suspension to stand for a sufficient period (e.g. for a week), wherein the carbon nanotube is surface-treated so as to be anionic. It is thus obvious that the resultant gel is only composed of the polymeric material and the carbon nanotube, not containing ionic liquid, in which the polymer acts as a cross-linking agent for the carbon nanotube (¶ [0051], ¶ [0091]).

Regarding Chen's gel polymerization, Chen states: "Gel formation may be obtained merely by keeping a suspension of nanotubes in a solution of suitable monomer for a sufficient period to allow gel formation to occur. The nanotubes should be anionic so as to remain in suspension during gel formation." ¶ [0051], and "A pyrrole and carbon nanotube suspension as described in Example 1 was allowed to stand in a small beaker in a sealed plastic bag for a few weeks. It was then observed that the solution had gelled. High-resolution SEM and TEM examinations of small amounts of these gels indicated the presence of polymeric material between the nanotubes, which almost certainly acted as a cross-linking agent." (Example 3) ¶ [0095].

Thus, the gels formed by this method are entirely free of ionic liquid.

The gel composition of the present invention is entirely different from the gel as disclosed in Chen reference. For example, with regard to the gel composition of the present invention, ¶ [0022] of the specification states: "It is thought that the gel formation is not due to the entanglement of carbon nanotubes, but is caused by the formation of a crosslinked structure (three-dimensional network structure) in which the ionic liquid molecules, attached to the surfaces of the less entangled carbon nanotubes through the "cation-π" interaction, serve to combine the bundles of carbon nanotubes

with one another through ionic bonding." Thus, in the gel composition of the present invention, the ionic liquid itself functions as something like a cross-linking agent for CNT. In addition, the gel composition of the present invention has advantages over the gel of Chen in that the former can be formed in about five minute to one hour, without the chemical treatment (modification) of CNT surfaces which may damage the characteristic features of the CNT.

Method claims

Dependent claim 3 further recites a method for producing the claimed gel composition which includes a step of pulverizing, in the presence of the ionic liquid, the carbon nanotube by applying a shearing force thereto.

Chen makes no suggestion of these three elements: a carbon nanotube (1) and an ionic liquid (2) which are pulverized under a shearing force (3).

Regarding claim 5, Chen teaches forming a film by an electrochemical polymerization method, as described above, but discloses nothing about forming a desired shape from a gel composition, which requires an ionic liquid, by subjecting the composition in a fluidized state to application of an external force by a printing, coating, extrusion or injection operation.

In summary, Chen does not disclose, nor is it enabling for, a gel composition and method as claimed. As detailed in the above, the composite of Chen's invention is either a film of CNT and electrically conductive polymer, or a gel composed of CNT and electrically conductive polymer, both not containing ionic liquid, and thus clearly distinguished from the gel composition of the present invention which is composed of CNT and ionic liquid.

Accordingly, it is submitted that claims 1-5 distinguish patentably and unobviously over Chen.

CONCLUSION

For the reasons detailed above, it is respectfully submitted all claims remaining in the application (Claims 1-5) are now in condition for allowance.

Respectfully submitted,

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